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(54) Title of the Invention: FORMATION OF ACTIVE MATRIX LIQUID CRYSTAL DISPLAY AND DRIVING METHOD THEREFOR

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Specification

1. Title of the Invention

FORMATION OF ACTIVE MATRIX LIQUID CRYSTAL DISPLAY AND DRIVING METHOD THEREFOR

2. Scope of Claim

(1) In a method of forming an active matrix liquid crystal display, a method of forming the active matrix liquid crystal display characterized by producing the liquid crystal display by combining a photolithographic step and a resist printing step.

(2) In a method of forming an active matrix liquid crystal display, a method of forming the active matrix liquid crystal display characterized by forming a built-in peripheral circuit in a photolithographic step and a display part in a resist printing step.

(3) In a method of forming an active matrix liquid crystal display, a method of forming the active matrix liquid crystal display characterized by using a photolithographic step only in forming a channel length L of a TFT of a display part and doing the other processes in resist printing steps.

(4) In a method of forming an active matrix liquid crystal display, a method of forming the active matrix liquid crystal display characterized by positioning a built-in peripheral circuit formed in a photolithographic step in as narrow region as possible.

(5) In a driving method of an active matrix liquid crystal display, a driving method of the active matrix liquid crystal display characterized by:

producing a plurality of peripheral driving circuits formed in photolithographic steps on a glass substrate; and

driving a display part with one or those of the built-in peripheral circuits that have no defects.

(6) In a driving method of an active matrix liquid crystal display, a driving method of the active matrix liquid crystal display characterized by:

dividing a built-in peripheral circuit formed in a photolithographic step into plural; and

substituting a COG (Chip ON GLASS) for one or those of the built-in peripheral circuits which have some defects.

(7) In a driving method of an active matrix liquid crystal display, a

driving method of the activ matrix liquid crystal display characteriz d by substituting an external peripheral circuit for a defective part of the built-in peripheral circuits formed in a photolithographic step.

3. Detailed Description of the Invention

[Industrial Field for the Invention]

The present invention relates to an active matrix liquid crystal display, particularly a formation of a large area liquid crystal display and a driving method therefor.

[Prior Art]

Conventionally, a constitution of an active matrix liquid crystal display is described, for example, in 1988 INTERNATIONAL DISPLAY RESEARCH CONFERENCE DIGEST pp.215 to 219. Here the above structure is shown in Fig. 2. In Fig. 2, reference number 1 denotes a glass substrate, 2 denotes a display part, 6 denotes a driving circuit on a scanning side, and 7 denotes a driving circuit on a signal side. All the above structures are formed in photolithographic steps.

[Problems to be Solved by the Invention]

When a large area display of the above conventional structures is produced by photolithographic steps, low throughput is obtained since a throughput capacity of the photolithographic step itself is slow and it is impossible to process a large amount of large area substrates at a time. On the other hand, when a large area display of the above conventional structures is produced by resist printing steps, higher throughput can be obtained, but it is difficult to form a built-in peripheral circuit which needs to be comparatively finely processed. The purpose of this invention is to produce the large area display of the above conventional structures with high throughput.

[Means for solving the Problems]

The purpose above is achieved by producing a liquid crystal display by combining a photolithographic step and a resist printing step.

[Operation]

In the process above, since a resist printing step is used as a part of process, throughput is improved. Also, the photolithographic step is used for constituting a built-in peripheral circuit and the like, which needs to be comparatively finely processed, so that a normal built-in peripheral circuit can be formed. Thus, by the present invention, an active matrix liquid

crystal display with a built-in peripheral circuit can be produced with high throughput.

[Embodiment]

An embodiment of the present invention follows with reference to Fig. 1.

Fig. 1 shows an embodiment of the present invention. In Fig. 1, reference number 1 denotes a glass substrate, 5 denotes a display part formed in a resist printing step, 6 denotes a driving circuit on a scanning side which is a part of the peripheral circuits formed in photolithographic steps, and 7 denotes a driving circuit on a signal side which is a part of peripheral circuits formed in photolithographic steps. Namely, by using both the photolithographic step and the resist printing step as a constituting process of Fig. 1, throughput is improved.

Fig. 3 is an embodiment of a pattern of a display part in the case where the present invention is used. In Fig. 3, reference number 10 denotes a signal electrode, 11 denotes a scanning electrode, 12 denotes a contact hole, 13 denotes an extrinsic polycrystalline silicon film, 14 denotes an ITO, reference symbol W denotes a channel width, and L denotes a channel length. Here, as a means of improving the current driving performance of TFTs, there is a way to shorten the channel length L. For the above reason, in Fig. 3, the photolithographic step is used only for a process of forming the channel length L, namely, for forming the scanning electrode 11, and the resist printing step is used for the other processes. By using the process above, high throughput of a liquid crystal display and high performance of TFTs are accomplished.

Fig. 4 is an embodiment in the case where the present invention is applied to a liquid crystal display with a built-in peripheral circuit. In Fig. 4, reference number 1 denotes a glass substrate, 5 denotes a display part formed in the resist printing step, 6 denotes a driving circuit on a scanning side which is a part of the peripheral circuits formed in the photolithographic steps, and 7 denotes a driving circuit on a signal side which is a part of peripheral circuits formed in the photolithographic steps. In Fig. 4, the peripheral circuits are formed in as narrow region as possible. In an LSI, yield is proportionate to area. For the reason above, the yield of the peripheral circuits in Fig. 4 improves, and so does the throughput of the liquid crystal display.

Fig. 5 is an embodiment in the case where the present invention is applied to a crystal display with a built-in peripheral circuit. In Fig. 5, reference number 1 denotes a glass substrate, 5 denotes a display part formed in the resist printing step, 6-1 to 6-N each denotes a driving circuit on a scanning side which is a part of the peripheral circuits formed in the photolithographic steps, and 7-1 to 7-M each denotes a driving circuit on a signal side which is a part of the peripheral circuits formed in the photolithographic steps. In Fig. 5, one or those of the driving circuits on a scanning side which have no defects, 6-1 to 6-N, and one or those of the driving circuits on the signal side which have no defects, 7-1 to 7-M, drive the display part 5. For this reason, the yield of the peripheral circuits in Fig. 5 improves, and so does the throughput of the liquid crystal display.

Fig. 6 is an embodiment in the case where the present invention is applied to a liquid crystal display with a built-in peripheral circuit. In Fig. 6, reference number 1 denotes a glass substrate, 5 denotes a display part formed in the resist printing step, 6-1 to 6-N each denotes a driving circuit on a scanning side which is a part of peripheral circuits formed in the photolithographic steps, and 7-1 to 7-M each denotes a driving circuit on a signal side which is a part of the peripheral circuit formed in the photolithographic steps. In Fig. 6, one or those of the driving circuits on a scanning side which have no defects, 6-1 to 6-N, and one or those of the driving circuits on a signal side which have no defects, 7-1 to 7-M, drive the display part 5. For this reason, the yield of the peripheral circuits in Fig. 6 improves, and so does the throughput of the liquid crystal display.

Fig. 7 is an embodiment in the case where the present invention is applied to a liquid crystal display with a built-in peripheral circuit. In Fig. 7, reference number 1 denotes a glass substrate, 5 denotes a display part formed in the resist printing step, 8-1 to 8-N are parts of a driving circuit on a scanning side which is formed in the photolithographic step and divided into N, and 9-1 to 9-M are parts of a driving circuit on a signal side which is formed in the photolithographic step and divided into M. In the structure shown in Fig. 7, for example, even if there are some defects in section 9-2 and 8-N as shown in Fig. 7 (a), a COG (Chip on GLASS) can be substitute for the defective parts as shown in Fig. 7 (b). From the above, the throughput of the liquid crystal display improves by the above deficiency solution.

Fig. 8 is an embodiment in the case where the present invention is applied to a liquid crystal display with a built-in peripheral circuit. In Fig. 8, reference number 1 denotes a glass substrate, 5 denotes a display part formed in the resist printing step, 7 denotes a driving circuit on a signal side formed in the photolithographic step, and 6 denotes a driving circuit on a scanning side formed in the photolithographic step. In the structure shown in Fig. 8, for example, even if there are some defects in the driving circuit on the scanning side 6 as shown in Fig. 8 (a), an external driving circuit on the scanning side (IC: INTEGRATED CIRCUITS) can be a substitute for the defective part as shown in Fig. 8 (b). From the above, the throughput of the liquid crystal display improves by the above deficiency solution.

[Effect of the invention]

According to the present invention, a large area liquid crystal display with a built-in peripheral circuit can be produced with high throughput. Thus, there are the advantages of accomplishing high performance and cost reduction and so on of the liquid crystal display.

4. Brief Description of the Drawings

Fig. 1, Fig. 4, Fig. 5, Fig. 6, Fig. 7 and Fig. 8 show plan views showing structures of liquid crystal displays with built-in peripheral circuits which are embodiments of the present invention, Fig. 2 shows a plan view showing a structure of a conventional liquid crystal display with a built-in peripheral circuit, and Fig. 3 shows a plan view showing a structure of a display part of a liquid crystal display which is an embodiment of the present invention.

1···A glass substrate

2···A display part formed in a photolithographic step

5···A display part formed in a resist printing step

6···A driving circuit on a scanning side formed in a photolithographic step

6-1 to 6-N···A plurality of driving circuits on a scanning side formed in a photolithographic step

7···A driving circuit on a signal side formed in a photolithographic step

7-1 to 7-M···A plurality of driving circuits on a signal side formed in a photolithographic step

8-1 to 8-N···Parts of a driving circuit on a scanning side which is formed in

a photolithographic step and divid d into N

9-1 to 9-M···Parts of a driving circuit on a signal side which is formed in a photolithographic step and divided into M

COG···Chip on GLASS

10···A signal electrode

11···A scanning electrode

12···A contact hole

13···An extrinsic polycrystalline silicon film

14···ITO

W···A channel width

L···A channel length

Fig. 1

1···A glass substrate

5···A display part formed in a resist printing step

6···A driving circuit on a scanning side formed in a photolithographic step

7···A driving circuit on a signal side formed in a photolithographic step